FEATURE

Our Hidden Infrastructure

By Kevin Vine

In 2014, the Damage Information Reporting Tool (DIRT) reported more than 273,000 incidents of underground utility damage during excavations across Canada and the United States—an increase of over 48,000 incidents from 2013. The report also found that 17 per cent of these events were caused by insufficient locating practices and another 25% caused by locates not being requested.

The integrity of utility infrastructure and utility data has never been more critical; a drop in communications for even a short period could be catastrophic for many corporations, not to mention the utility owner.

During the design phase of an infrastructure project, it is often difficult to get an accurate picture of subsurface utilities, which can create unnecessary risk and liability for project stakeholders. Data provided to project managers, engineers, and designers are frequently outdated, inaccurate, or unavailable. Adding to the problem is the fact that, historically, there has been a lack of regulation around collecting, recording, and managing subsurface data.

In response to these challenges, the American Society of Civil Engineers (ASCE) formed a committee in 1996 to create the first national consensus standard in the world, defining the quality of utility location and attributing information included on plans. Known as ASCE 38-02, Guideline for the Collection and Depiction of Existing Subsurface Utility Data, the standard defined the concept of subsurface utility engineering (SUE): a process for managing risk by

identifying and controlling the quality of underground utility infrastructure data used in the design, development, and construction of a project. Many countries have followed the United States' lead by creating similar standards, including Malaysia, Canada, Australia, and most recently, Great Britain.

Developed and refined over the past 20 years, SUE is a branch of engineering practice that classifies information according to quality levels with an objective to vastly improve data reliability. This provides project owners and engineers with a benchmark to determine the integrity of utility data at the outset of an infrastructure project. Once collected, data is typically presented in CAD format or a GIS-compatible map. A conflict matrix is also created to evaluate and compare collected utility information with project plans, identify conflicts, and propose solutions.

THE CANADIAN REGULATORY FRAMEWORK

Though SUE is not officially legislated in Canada, in 2011, the Canadian Standards Association (CSA) released S250, Mapping of Underground Utility Infrastructure, which builds upon ASCE 38-02 and outlines best practice for mapping and managing records for underground infrastructure. The standard developed out of a recognized need by utility owners, the Federation of Canadian Municipalities, contractors, and locators to improve data collection processes and clean up existing records.

CSA S250 complements and extends ASCE 38-02 by setting out requirements for generating, storing, distributing, and using mapping records to ensure underground utilities are readily identifiable and locatable. Accuracy levels expand upon SUE Quality Level A, prescribing a finer level of detail to define the positional location of the infrastructure. The standard also defines accuracy parameters for as-built records and specifies the utility attributes to be used for describing and depicting newly built underground utility infrastructure. This promotes a consistent, effective approach to data collection that ensures the quality of utility records well into the future.

Though relatively new, the standard has already been integrated by several authorities including the City of

Toronto. Utility and right of way owners such as Union Gas and the Ontario Ministry of Transportation are also looking to improve their current records practices based on guidance provided by CSA S250. The CSA is encouraging all organizations to leverage S250 as a records management framework going forward since it could quickly become a facet of municipal construction contracts and eventually be legislated in Canada.

SUE IN INFRASTRUCTURE DESIGN

As the need for SUE becomes more apparent both nationally and worldwide, many cities and municipalities are implementing SUE either directly in the design phase or completing SUE projects ahead of engineering RFP's. The latter practice controls the SUE data and reduces interpretation risks and higher costs associated with outsourcing as a component of the design RFP.

SUE played an integral role in the recent Union Station Revitalization project, designed to bring many new enhancements to riders such as a roof and glass atrium over passenger platforms and railway tracks, new staircases, additional vertical access points, and an overhaul of the platforms and station concourses. This project included significant analysis and review for reconfiguration of track between the Don River and Strachan Avenue.

Because the track had been subject to change and resurveyed multiple times over the years, concerns arose over the accuracy of existing data, particularly for subsurface assets. "We're dealing with infrastructure that is 50 to 70 years old," said Florin Doru Merauta, senior project engineer and electrical lead with Hatch Mott MacDonald. "We were uncertain of the location of underground utilities and were working with disparate datasets that were scattered across multiple platforms. Adding to the challenge was the fact that GO Transit's interlocking track system is considered one of the most complex in North America."

The SUE process was implemented to get an accurate depiction of all existing public and privately owned utility services including gas, hydro, water, fibre optics, telecommunications, and signal cabling. Non-destructive geophysical inspection methods—including ground-penetrating radar and electromagnetic induction—were leveraged to detect buried cables and utilities that crossed the rail corridor. Collected data were referenced against existing maps to reveal inconsistencies, and information was then stored in a central database.

Property boundary and topographic data was also gathered and overlaid on a map to generate a 3D topographic survey. The study resulted in a documented understanding of the Union Station Rail Corridor (USRC) ownership and easements, detailed knowledge of surface infrastructure, and the inferred spatial position of all underground utilities targeted by the investigation.

"We used to rely on older records and would need to resurvey a project area every time there was a change, which would drive up costs," Merauta said. "Surveyors would bring their own tools and data would be stored disparately after every survey. We now have a consistent database of accurate information that conforms to GO Transit standards and can be leveraged by contractors for years to come."

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SUE was also leveraged to identify underground utilities during the QEW Credit River environmental assessment (EA) study, completed to inform a long-term strategy for addressing the rehabilitation needs of the QEW Credit River Bridge. During the EA and the preliminary design stage, quality levels A and B were implemented to identify potential impediments to the design and construction of underground installations. Using non-destructive inspection methods, locatable underground utilities were targeted for further investigation. Quality Level A was completed to establish the precise vertical and horizontal positions of select buried utilities. This allowed for better design and utility coordination while minimizing the potential for conflict.

"This type of investigation is typically not completed during the preliminary design stages," said Dana Glofcheskie, project engineer with transportation planning at MMM Group. "However, SUE provides a much better level of accuracy than plans from utility companies coupled with aerial photos, allowing us to more confidently identify utility conflicts and develop a more detailed utility relocation plan. This in turn reduces risk for our client during future phases of the project."

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